

**REMARKS**

Receipt of the Office Action dated May 17, 2005 is acknowledged. Claims 1-3 have been amended herein. Claims 7-8 have been canceled. Claim 16 has been added. Claims 1-6 and 9-16 are pending, with claims 9-15 being withdrawn from consideration. Reconsideration is requested based on the following remarks.

The abstract is objected to as being improper. Claims 7-8 stand rejected under the judicially created doctrine of obviousness-type double patenting. Claims 1 and 4-6 stand rejected as being anticipated by McCollum et al. (U.S. Patent No. 3,948,755). Claims 2-3 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over McCollum et al. ("McCollum"). Claims 1 and 3-6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wilson et al. (U.S. Patent No. 3,733,259). Entry and reconsideration is respectfully requested.

**I. Specification**

The Abstract is objected to as being more than 150 words and comprising two paragraphs. The Abstract has been amended herein to comply with the Examiner's requirement.

**II. Information Disclosure Statement**

With respect to the Information Disclosure Statement ("IDS") filed November 19, 2003, the PTO has declined to consider the IDS because "a PTO-1449 is missing." A newly submitted IDS is submitted herewith citing the U.S. published application which corresponds to U.S. application serial no. 10/245,398.

### **III. Double Patenting**

There is also a provisional rejection of claims 7-8 under the judicially created doctrine of obviousness-type double patenting over claims 1, 3, 7 and 8 of co-pending application no. 10/245,398. Reconsideration of the provisional rejection in light of the cancellation of claims 7-8 herein.

### **IV. Claims 1 and 4-6 are patentable over McCollum**

Claims 1 and 4-6 stand rejected as allegedly being anticipated by McCollum. Claim 1 has been amended herein. For the reasons set forth below, claims 1 and 4-6 which depend from claim 1 are not anticipated by McCollum.

Claim 1 recites a heavy oil reforming method which comprises reacting a heavy oil containing at least one of vanadium and sulfur with water which is heated to 300°C to 500°C and pressured to 10 MPa to 30 MPa, and then contacting the heavy oil with a scavenger for scavenging vanadium and/or sulfur in the heavy oil.

McCollum discloses a reaction at a temperature of 600-900 °F; however, McCollum does not disclose that the water has been “pressured to 10 MPa to 30 MPa.” In fact, McCollum discloses that the reaction takes place at atmospheric pressure (0.1 MPa). For at least this reason, claims 1 and 4-6 are patentable over McCollum.

Additionally, the reaction disclosed in McCollum is in the presence of a catalyst. In contrast, the present invention can eliminate (separate and remove) sulfur (and/or vanadium) from a heavy oil by reacting the heavy oil with water which is in a state of being heated to 300°C to 500 °C and pressured to 10 MPa to 30 MPa, even if any catalyst is not present. For at least these reasons, claims 1 and 4-6, as amended, are patentable over McCollum

**V. Claims 1-3 and 6 are Patentable over the Prior Art of Record**

Claims 2-3 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over McCollum. Claims 1 and 3-6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wilson et al. As a first matter, applicants points out an ambiguity in the Office Action. At page 5 of the Office Action, the PTO states in the rejection of claims 2 and 3 as being obvious over McCollum that “it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Wilson by operating the process of Wilson at either supercritical water or subcritical water because McCollum suggests . . . .” (emphasis added). Based on this language, the applicants are basing their response as if the rejection were based on both Wilson and McCollum.

As set forth above, claim 1 recites a heavy oil reforming method which comprises reacting a heavy oil containing at least one of vanadium and sulfur with water which is heated to 300°C to 500°C and pressured to 10 MPa to 30 MPa, and then contacting the heavy oil with a scavenger for scavenging vanadium and/or sulfur in the heavy oil.

Wilson discloses that sulfur and other metals are removed from a heavy petroleum oil by forming a dispersion of an oil with water, maintaining the dispersion at a temperature between 750 and 850 °F (399-454°C) and a pressure between atmospheric and 100 p.s.i.g. (about 0 to 0.69 MPa gauge pressure) for a prescribed period of time, cooling the dispersion to form a water-asphaltene emulsion, separating the emulsion from the treated oil and subjecting the resulting treated oil to a prescribed reaction in the presence of catalyst at a temperature between 500 and 900 °F (260-482 °C) and a pressure between 300 and 3,000 psig ( 2.07 to 20.7 MPa gauge pressure). Wilson discloses a reaction at a temperature of 750 and 850 °F (399-454°C); however,

Wilson does not disclose that the water has been “pressured to 10 MPa to 30 MPa.” In fact, Wilson discloses that the reaction takes place at atmospheric pressure (0.1 MPa) to 100 p.s.i.g. (0.69 MPa). For at least this reason, claim 1 is patentable over Wilson. There is nothing in McCollum to overcome the deficiencies in Wilson. Therefore, claim 1, as amended, is patentable over Wilson and McCollum.

Moreover, according to Wilson, since the asphaltenes contained in an oil adversely affect the activity of a catalyst, the asphaltenes are removed in the form of water-asphaltene emulsion prior to removing sulfur by adding a catalyst. In contrast, the present invention does not require an addition of a catalyst. Thus, it is not necessary to form a water-asphaltene emulsion according to the present invention. In the present invention, sulfur (and/or vanadium) are removed from a heavy oil by reacting the heavy oil with water which is in a state of being heated to 300°C to 500 °C and pressured to 10 MPa to 30 MPa, and then bringing said heavy oil into contact with a scavenger.

While Wilson discloses a post-treating reaction at a temperature of 500-900° F (260-482 °C) and a pressure of 300 and 3,000 psig (2.07 to 20.7 MPa gauge pressure). This disclosure also does not obviate the claimed invention. Wilson’s post treatment reaction requires a presence of a catalyst in the reaction. Additionally, the oil to be subjected to the reaction in Wilson is a treated remaining oil from which the asphaltenes have been already removed in the form of water-asphaltene emulsion. Thus, the oil to be subjected to the reaction in Wilson is different from a heavy oil to be reacted in the present invention. For at least these reasons, claims 1 and 16 are patentable over Wilson and McCollum. Since claims 2-6 depend from claim 1, for at least this reason these claims are also patentable over the Wilson and McCollum.

**VI. Conclusion**

In view of the above amendment, applicants believe the pending application is in condition for allowance.

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Respectfully submitted,

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